

Landscape Modelling for Sustainable Urban Management

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Abstract

Urbanisation is a form of metropolitan growth in response to often bewildering sets of economic, social, and political forces and to the physical geography of an area. This could be planned (in the form of townships) or unplanned (organic). Many organic cities are now undergoing redevelopment for economic purposes with new roads, infrastructure improvements, etc. It results in the increase in population in proportion to the region's rural population. This phenomena is very rapid in India and pose serious challenges to the decision makers in the city planning and management process involving plethora of issues like infrastructure development, traffic congestion, and basic amenities (electricity, water, and sanitation), floods, heat island, loss of aquatic eco-system, etc. It requires an understanding of landscape characterisation and urban dynamics with causal factors. Identifying, delineating and mapping landscapes on temporal scale provide an opportunity to monitor the changes, which is important for natural resource management and sustainable planning activities. Multi-source, multi-sensor, multi-temporal, multi-frequency or multi-polarization remote sensing data with efficient classification algorithms and pattern recognition techniques aid in capturing the dynamics. In this work we analyze the landscape dynamics in Greater Bangalore by characterising: (i) Direct impervious surface modelling, (ii) Forest fragmentation modelling and index and (iii) Urban growth type modeling to quantify and categorise urban change. Linear unmixing is used for solving the mixed pixel problem of coarse resolution super spectral MODIS data for impervious surface characterization. Supervised classification performed on temporal datasets indicated intense urbanization with 466 % increase in built up (during 1973 to 2007) and a sharp decline of water bodies (61%). Increased paved surface and concentrated human activities has led to urban heat island effect, as there is increase in temperature between urban pixels compared to its surroundings. Urban growth characterization model was developed to determine the type of urban growth – Infill growth, Expansion and Outlying growth. Combining several temporal urban growth maps creates an informative picture of the urban dynamics. Local decision makers can see the results of past decisions and policies to incorporate the lessons into future land use policies for sustainable planning and management.